

dosis. While the numbers of the current preliminary review are too limited to draw definite conclusions of the benefits of RCP versus DHCA, they support the continued investigation of the technique.

1069-158

Repair of Aortic Coarctation in Infants: Results of a Tailored Surgical Approach in the Modern Era

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Background: The surgical repair of aortic coarctation in infants has evolved over time, largely in response to high rates of residual or recurrent coarctation. This review evaluates our current approach utilizing extended end-to-end anastomosis without prosthetic material to enlarge all areas of aortic arch hypoplasia.

Methods: The Michigan Congenital Heart Center surgical database was reviewed for infants who underwent isolated repair of aortic coarctation from January 1, 1990 to January 1, 2000. Patients who underwent simultaneous repair of other lesions and those with significant associated lesions were excluded.

Results: Eighty-three infants underwent surgical repair of isolated coarctation during this decade. Median age at repair was 21 days (range 3-363 days). Repair was performed via thoracotomy in 72 patients while the remaining 11 underwent median sternotomy with circulatory arrest because of severe transverse arch hypoplasia. There were 2 deaths: 1 due to pulmonary hypertension in a patient with alveolar capillary dysplasia and 1 late death of pneumonia in a patient with non-cardiac anomalies. Neither had residual coarctation. Technique related complications of bronchial compression, chylothorax, and vocal cord paralysis were noted in 4 patients. At discharge, 14 patients had a gradient ≥ 15 mmHg by both physical exam and echocardiogram. Follow-up data were available for 65 patients (78%) with mean follow-up duration 4.3 years (SD ± 3.1 years). Reintervention was required in 4 patients (6%). One underwent reoperation after 1 month, and 3 underwent balloon angioplasty within 7 months of initial repair. The remaining 60 patients are asymptomatic, on no anti-hypertensive medications, and have aortic arch gradients < 15 mmHg. One developed subaortic stenosis necessitating resection.

Conclusion: Tailored surgical repair for aortic coarctation has a low rate (6%) of residual and recurrent coarctation even when performed in infants. Mortality and morbidity are low. Thus far, this low recurrence rate approaches that reported with other techniques in older children.

1069-159

Pulmonary Position Cryopreserved Homografts: Durability in Ross and Non-Ross Patients

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Actuarial 5 year survival rates for right ventricle to pulmonary artery (RV-PA) homografts are reported to range between 49% and 81%. It is not known whether there is a difference in homograft durability when utilized for right ventricular outflow tract (RVOT) disease or for the Ross operation for pulmonary autograft replacement of the aortic valve. To evaluate outcome and risk factors for implant failure in patients who have undergone pulmonary position homograft placement for RVOT obstruction or the Ross operation, the records of all patients receiving an RV-PA homograft at this institution from January 1990 to January 2001 were reviewed. 148 consecutive patients were included in the study (65 Ross and 83 RVOT repairs). Adequate data was available on 136 (92%). The median follow-up time was 3.8 yrs (1mo-11yrs). Right ventricular homograft survival after Ross and non-Ross operations at 8yrs was 85% and 58% respectively (p10yrs). Potential risk factors for homograft failure analyzed: age at operation, diagnosis, type of surgery, homograft type (aortic vs. pulmonic) and width of homograft (mm). On univariate analysis: young age, homograft width, and non-Ross operation were risk factors for homograft failure ($p < .01$). On multivariate analysis: smaller homograft width was the single predictor of graft failure ($p < .01$). Outcomes were compared for 3 age groups: 10 yrs (n=39). Homograft failure rates were 35%, 20% and 3% for the 3 groups respectively. For non-Ross patients; failure rates were: 43%, 25% and 14% and for Ross patients; 12.5%, 9% and 0%.

Conclusions: 1. Ross patients had significantly longer homograft survival than RVOT disease patients. 2. Smaller homografts placed in younger patients required earlier intervention. 3. Pulmonary position homografts inserted in Ross patients at young ages (< 10 yrs) lasted longer than similar aged non-Ross patients; whereas patients older than 10 yrs at the time of operation had similar failure rates.

1069-160

Surgical Correction of Tetralogy of Fallot in Adults in the Current Era

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BACKGROUND: Information on the surgical results in adult uncorrected Tetralogy of Fallot (TOF) patient is scanty. **METHODS:** In this retrospective study we sought to (1) examine the patient characteristics, (2) review the surgical outcomes, (3) analyze the frequency and determinants of early post-operative morbidities, and (4) provide long term survival data. **RESULTS:** From 1/1980 to 12/2000, a total of 221 patients had surgical correction of TOF in our center. Twenty-four patients older than 18 years of age were identified (mean 34.9 years). Ten patients (42%) had immigrated to the United States. Reasons for delayed surgical correction in the immigrants included a lack of surgical facilities in their home countries and/or non-diagnosis. In the permanent residents, definitive surgical correction had not been undertaken due to satisfactory palliation after palliative procedure (9/14, 64.3%), non-compliance with medical advice (3/14, 21.4%) and institutionalization for Downs syndrome (2/14, 14.3%). Surgical corrections were successful in all patients. Three patients (12.5%) developed conduction disturbances after operation. Seven patients (29.2%) developed clinically significant atrial arrhythmias and 1 patient (4.2%)

developed repeated episodes of non-sustained ventricular tachycardia in their early post-operative period. Two of the 7 atrial arrhythmias were paroxysmal, the remaining 5 were persistent and required treatment. Univariate analysis showed previous surgical palliation ($p = 0.028$) and a higher Qp : Qs ratio ($p = 0.045$) were significantly associated with early postoperative atrial arrhythmia. One patient (4%) died during the hospitalization. On the basis of available survival data in 21 patients, the probability of survival at 5, 10, 15 and 20 years postoperatively were 95%, 95%, 78%, and 68% respectively. **CONCLUSIONS:** Successful late surgical repair of TOF in these patients can be achieved with low surgical mortality and favorable long term survival in centers with experience in dealing with adult congenital heart disease. Atrial arrhythmias and conduction disturbance are the most common source of early postoperative morbidity in this group of patients.

1069-161

The Bidirectional Cavopulmonary Shunt in Young Patients With Interrupted Inferior Vena Cava: The Semi-Fontan

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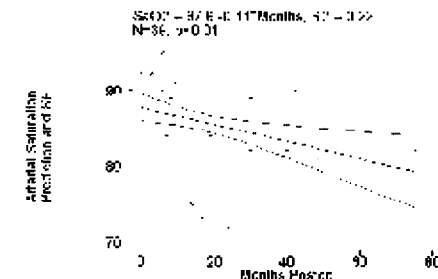
Background: Interruption of the inferior vena cava (iIVC) is often seen in the heterotaxy syndromes, where complex cardiac lesions can make a two-ventricle repair impossible. Bidirectional cavopulmonary shunt (BCPS) in this group results in a near complete Fontan or semi-Fontan.

Hypothesis: Because more systemic venous return is diverted to the pulmonary bed at a young age, this group is at risk for increased morbidity/mortality after BCPS.

Methods: We retrospectively reviewed the cardiology database and included all pts with an iIVC who underwent BCPS at Children's Hospital of Wisconsin between 1/90 and 5/02.

Results: Eleven pts were identified. Diagnoses included unbalanced AVSD with double outlet right ventricle (n=8), single left ventricle (n=1), multiple VSD's with RV hypoplasia (n=1), and HLHS (n=1). Prior to BCPS, 6 pts had 8 operations including Norwood in 4, aortopulmonary shunt in 2, pulmonary artery band in 1, and valvuloplasty in 1. At the time of BCPS, the median age was 8.5 mo (range 3.5-33 mo). There were no early/late deaths with a median hospital stay of 7 days. The mean oxygen saturation at discharge was 88%. Progressive desaturation was seen in the majority of pts with an average saturation drop of 0.1%/mo (see graph). Completion Fontan has been performed in 4 pts however the majority of pts remain well saturated at intermediate follow-up.

Conclusions: The semi-Fontan can be performed safely and at an early age in the subgroup of pts with complex heart disease and iIVC.



1069-162

Insights Into Mitral Valve Function After Repair of Atrioventricular Defects: Follow-Up Studies Using Real-Time Three-Dimensional Echocardiography With Color Doppler Mapping

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Background: Previous 2D studies in atrioventricular canal (AVC) patients after repair have defined inadequate mural or lateral leaflet area as the major determinant of lateral commissural mitral regurgitation (MR), and inadequate inferior leaflet area as the major determinant of medial or cleft related MR. **Methods:** We studied 15 patients, ages 2-20 years, 6 male and 9 female, who had undergone repair of AVC defect, including routine cleft closure. Eight of them had Downs syndrome, 9 had complete canal defect, and 6 had partial defect. Real time 3D echo was performed (Volumetrics Model 1, Durham, NC) with a pyramidal color Doppler sector, 24° in angle so as to obtain at least 9-10 frames/sec of a 64° pyramidal volume. **Results:** Three patients had moderate MR, 12 had mild MR. In 4 of these cases (all mild), it was medial paraseptal "cleft" MR and the rest (mild 8; moderate 3) had lateral leaflet non-coaptation MR. All patients had mild tricuspid regurgitation and none were on medication. In those patients with mild MR, the 3D analysis showed a mean of $43 \pm 10\%$ of the available leaflet area for the superior leaflet, $34 \pm 5\%$ of the inferior leaflet, and $24 \pm 6\%$ of the mural leaflet. All 3 patients with moderate MR and non-coaptation had lateral leaflet area $< 18\%$. **Conclusions:** Real time 3D color

Doppler echocardiography provides observations that could be of assistance during AV defect repair.



POSTER SESSION

1094 Pediatric Cardiology I

Monday, March 31, 2003, 9:00 a.m.-11:00 a.m.

McCormick Place, Hall A

Presentation Hour: 9:00 a.m.-10:00 a.m.

1094-155 Acute Hemodynamic Effects of New Inotropic Agent(Colforsin Daropate) in Pediatric Patients With Left to Right Shunt Disease

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Background: Colforsin daropate(Colf) is new positive inotropic agent which having vasodilating effects. These effects are mediated by an increase in intracellular c-AMP concentration caused by the stimulating action of Colf on adenylate cyclase, and not through beta-adrenoreceptor. Such characteristics may have advantage in treatment of left to right(LR) shunt disease.

Objective: To evaluate the hemodynamic effects of Colf, 15 patients(age:5.2±5.9yrs) with LRshunt disease(VSD:ASD=7:8) and 10 controls underwent Colf(0.5ug/kg/min) infusion challenge examination during catheterization, and compared to dopamine(DOA) infusion(5.10ug/kg/min).

Result: In the control group, Colf significantly increased of cardiac index (2.79±0.54 to 2.93±0.54) as same efficacy as DOA(10ug). Hemodynamic effects in LR shunt group was shown in table. No significant hemodynamic responses were observed between ASD and VSD patients in our study protocol.

Conclusion: Those data suggested that Colf had similar positive inotropic effect as DOA(10ug) without increasing of shunt ratio in patients with LR shunt disease. Such clinical features may play an important role for treatment of congestive heart failure in this setting.

Hemodynamic results

	Control	DOA 5u	DOA 10u	Colf 0.5u
HR	100.1±6.4	100.2±5.9	110.4±8.8*	110.7±7.1*
RA(m)	3.5±0.4	4.2±0.5	4.4±0.6	2.7±0.3*
pcwp	8.2±0.9	8.3±0.9	7.9±0.9	6.3±0.8*
PA(m)	23.4±3.7	25.2±3.9*	30.7±5.1*	22.8±4.1
AO(m)	75.5±3.6	75.3±3.3	85.6±3.5*	78.2±3.1
Qp/Qs	2.35±0.26	2.39±0.25	3.68±0.80*	2.04±0.18*
Rp/Rs	0.13±0.05	0.11±0.02	0.12±0.02	0.11±0.02

*p<0.05 versus control

1094-156 Myocardial Acceleration During Isovolumic Contraction as a New Index of Right Ventricular Contractile Function and Its Relation to Pulmonary Regurgitation in Patients After Repair of Tetralogy of Fallot

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Background: Myocardial acceleration during isovolumic contraction (IVA) obtained from tissue Doppler imaging (TDI) is a new noninvasive index of right ventricular (RV) contractile function that is unaffected by the shape of the ventricle and loading conditions. In this study, we assessed the utility of IVA to measure RV contractile function in patients after repair of tetralogy of Fallot (TOF).

Methods: We examined 18 TOF patients (6.2 ± 2.4 years) with significant PR but no significant RV outflow obstruction (gradients < 20mmHg) and 27 age-matched healthy children. Using TDI, Peak myocardial velocities during isovolumic contraction (IVV) and systolic ejection (S) were measured at the base of RV free wall from an apical 4-chamber view. IVA was calculated by dividing IVV by the time interval from onset of the wave during isovolumic contraction to the time at peak velocity of this wave. The grading of the degree of PR (mild, moderate, and severe) was based on color Doppler findings.

Results: TDI measurements are shown in the Table. S, IVV, and IVA in each TOF patient group were significantly lower than those in controls. However, S and IVV in the TOF patients remained constant regardless of severity of PR. There was a stepwise decrease in IVA from mild to severe PR. There was also a significant relationship between IVA and degree of PR (-0.82, p < 0.0001).

Conclusion: IVA may be an effective means of assessing RV contractile function in the TOF patients with various degree of PR.

	Control (n = 27)	Mild (n = 5)	Moderate (n = 7)	Severe (n = 6)
S (cm/sec)	11.7 ± 2.7	7.0 ± 0.7*	6.6 ± 1.6*	6.7 ± 1.7*
IVV (cm/sec)	8.1 ± 1.6	6.1 ± 1.0*	5.3 ± 0.6*	5.1 ± 1.2*
IVA (cm/sec)	258 ± 35	192 ± 5*	155 ± 22†	129 ± 16*†

*p < 0.01 vs control, †p < 0.01 vs mild PR, #p < 0.05 vs moderate PR

1094-157 Right Ventricular to Coronary Artery Communications in Pulmonary Atresia: A New Anatomic-Functional Classification and Its Utility in Predicting Immediate and Long-Term Outcome

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Background: The poor outcome in patients(pts) with pulmonary atresia(PAT) and right ventricle to coronary artery communications(RVCC) may be related to the fact that a significant portion of the left ventricular myocardium is dependant upon perfusion from these communications. Current definition of RVCC is qualitative and subjective. Therefore, we propose a new classification scheme for RVCC and test its utility in predicting the outcome. **Methods:** Charts of pts with PAT and RVCC between 1974-2002 were reviewed. The demographic, hemodynamic, angiographic, number and type of operations, immediate outcome and the latest follow-up data were collected. The RV/aortic angiograms were analyzed for RVCC patterns and were classified as types 0, 1, 2, 3, and 4. Type 0: faint retrograde filling of the secondary branches with no filling of the main coronary arteries. Type 1: retrograde filling of one of more main coronary arteries with out any luminal stenosis, irregularities, and with no retrograde filling of the ascending aorta(AA). Type 2: type 1 with luminal dilation and irregularities, with retrograde filling of the AA. Type 3: type 2 with stenosis in one or more main coronary arteries. Type 4: Type 2 or 3 with interruptions in one or more main coronary arteries. **Results:** Of 28 pts with PAT and RVCC, 26 had angiograms for analysis. We found RVCC type 0 in 5 pts, type 1 in 2, type 2 in 7, type 3 in 7, and type 4 in 5 pts. Two pts died before any surgical intervention and 26 pts had a shunt procedure. There were 2 post-operative deaths and 9 late deaths. The remaining 15 pts are alive and had further operations(biventricular repair in 1, 1.5 ventricular repair in 1, Fontan in 10, Glen in 1 and shunt in 2pts). Actuarial survival including in hospital and late deaths was 65%, 40%, and 20% at 5, 10, and 20 years respectively. Mortality was associated with RVCC types 3 and 4 (P<0.05). **Conclusions:** The long-term outcome of pts with PAT and RVCC is poor with a significant correlation between the types of RVCC and mortality. Left ventricular perfusion imaging of pts with RVCC types 3 and 4 may help develop specific treatment strategies and better risk stratification.

1094-158 Occult Myocardial Injury in Otherwise Healthy Newborns

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Hypothesis: Since the perinatal period is a time of the greatest pediatric myocardial stress, we proposed that the neonatal myocardium will sustain a greater injury from a similar insult than an older myocardium, demonstrating clinically occult myocardial injury.

Methods: Prospective study to identify whether otherwise healthy newborns without known cardiac disease had evidence of myocardial injury. The Elecsys Troponin T STAT Immunoassay identified cTnT values of >0.01 ng/ml as elevated. C-reactive protein (hsCRP) was measured by N High Sensitivity CRP assay, and CK-MB was assayed by ACS:180 CK-MB assay (>5.5 ng/ml elevated).

Results: Consent was obtained on 27 neonates (median bw 3.3 kg; median gestational age 39.7 wk; 93% AGA; median LOS 3 days). Median umbilical cord cTnT was 0.030 ng/ml (0.005-0.420 ng/ml); median neonatal serum cTnT was 0.068 ng/ml (0.005-0.437 ng/ml). Serum cTnT was elevated in 76% of patients (Pts) with umbilical cord samples with 93% of Pts with neonatal samples, occasionally at myocardial infarction levels. Pts with elevated CK-MB also had cTnT elevations. Myocardial injury was more common in otherwise healthy neonates than in older such children (6%), and was associated with lower 1 minute Apgar scores (r=-0.85, P<0.001), a younger gestational age (r=-0.53, P=0.04), increased LOS (r=0.52, P=0.046), non-white race (P=0.0085), and elevated hsCRP (r=0.79, P=0.0008), a marker of generalized inflammation. Elevated hsCRP correlated